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ABSTRACT

International interest in the use of the Internet and the World Wide Web in learning environments has become the major area of focus for many educators and instructional designers. While few dispute the value of hypermedia in instruction and training, the design, development, and implementation of Web-based learning has not been researched in any exhaustive way. This paper examines the experiences of one design and development team attempting to encourage critical thinking skills among a group of pre-service teacher education students. One of the basic components of the course, Higher Order Thinking for Educators, a course required of all students majoring in Elementary Education, is a series of case studies. The cases introduce the students to problems faced by teachers in public schools today. The course currently employs five case studies to allow the students to examine a situation, discuss its components, and arrive at possible solutions to the scenario, based on small group discussions. The learning objective for the cases was to enable pre-service teaching students to enhance individual problem solving abilities. These students were dispersed in various locations within the state in clinical experiences and spent only limited time in class with the cases. It was hoped that the students would improve their higher-order thinking skills and problem solving abilities if they spent more time working with the cases outside of class and then be able to transfer what they had learned to new situations in their school environments. The final product was a Web site consisting of approximately 25 Web pages that utilized the strengths of the Web, such as hypertext links to resources and learner-directed menu choices. A field test of the product was conducted in the content specialist's spring semester of the course. Feedback from student surveys impacted the final product, which was implemented the following academic year. Results showed students were very positive about the instructional value and aid to retention that the Web-based case study afforded them. (AEF)

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FACILITATING HIGHER ORDER THINKING: NEW TEACHER'S DILEMMA

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Introduction

International interest in the use of the Internet and the World Wide Web (WWW) in learning environments has become the major area of focus for many educators and instructional designers. While few dispute the value of hypermedia in instruction and training, the design, development, and implementation of web-based learning has not been researched in any exhaustive way. This paper will examine the experiences of one design and development team attempting to encourage critical thinking skills among a group of pre-service teacher education students.

One of the basic components of the course, Higher Order Thinking for Educators, a course required of all students majoring in Elementary Education, is a series of case studies. The cases introduce the students to problems faced by teachers in public schools today. The course currently employs five case studies to allow the students to examine a situation, discuss its components, and arrive at possible solutions to the scenario, based on small group discussions. The learning objective for the cases was to enable pre-service teaching students to enhance individual problem solving abilities. These students were dispersed in various locations within the state in clinical experiences and spent only limited time in class with the cases. It was hoped that the students would improve their higher-order thinking skills and problem-solving abilities if they spent more time working with the cases outside of class and then be able to transfer what they had learned to new situations in their school environments.

Why Case Studies

Case studies have been used effectively to provide scenarios containing problems that exist in real life situations. Since successful decision-making is based on experience, and many students lack experience, case studies serve to simulate experiences and enable better decision-making for novices. Kowalski, Weaver, and Henson (1990) refer to case studies as "...descriptions of a decision or a problem...normally written from the perspective of the decision maker involved. ...Once they have been developed, cases are used by students as a way of putting themselves in the decision maker's or problem solver's shoes." (p. ix). According to Wasserman (1993), using cases in teaching encourages learning by insisting that learners and teachers deal with first-hand knowledge and allow students to think critically about the situation, making sense of all the parts of the case. Then, they can make a truly informed decision.

Why WBT?

Considering the geographic dispersion of the students, the any time, any place nature of the web offered expanded access to the case study. It also provided an opportunity for students to self-pace their learning and think in greater depth about the situation described in the case. Students also had more time to reflect on the information they encountered and uncovered. To encourage this increased student-content interaction, the designers used digital photos of the individual players and made the scenario as believable as possible turning the case study into a simulation. Using images and text together, the team attempted to create a case whose "lessons learned" would transfer to real life. It was important that the students could identify with and put themselves in the "shoes" of the new teacher portrayed in the case.

The Design Team

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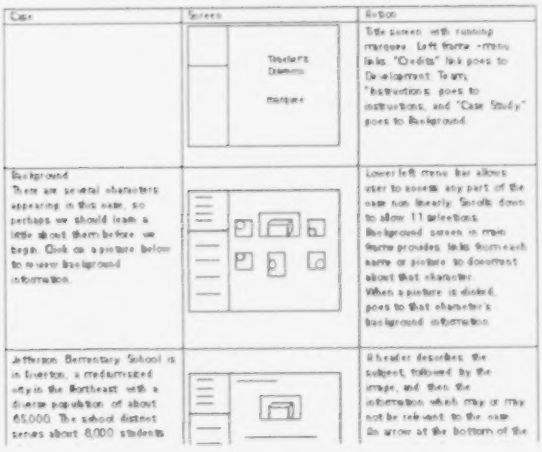
One case was selected for conversion to web-based delivery and was designed and developed by a cross-discipline team consisting of two students and four faculty members. In total the expertise of instructional designers, a content specialist, and technology experts were integrated to design and develop this unique web-based learning experience. The two instructional designers had experience conceptualizing and designing computer-based instruction and WWW applications. Additionally, each had expertise applying pedagogical theory to instructional objectives. The course instructor, who had extensive experience in problem-based learning, provided content. On the technology side of the team, both student programmers and the advising Information Systems faculty member were experienced in developing programs, especially utilizing WWW-based languages.

Initially, the team reviewed the case to make certain that all participants understood its content and the objectives for the activity and discussed ideas related to screen design and navigation. For instance, it was agreed that the online version must be creative, engaging, interactive, and utilize motion and sound where appropriate. One particularly critical activity in this initial stage was facilitating the content specialist's realization of the potential of the technology. While she had experience with case-based problem solving, she had little experience with the WWW and associated technologies. No attempt was made to determine exactly how concepts would be presented, since in this particular situation, the subject matter expert (SME) was also the client. Thus, it was imperative that we educate the client about the capabilities of web-based training before discussing issues such as video clips or animated gifs. Specifically, it was critical that she understand the nonlinear nature of the WWW and its interactive capabilities.

Design and Develop

The storyboard (see Figure 1) was a funnel for our brainstorming sessions. Capturing the essence of these sessions, we developed a board. In addition, we adapted a typical storyboarding situation to capture the transformation of the written case to a proposed screen design and related actions. The left side of the storyboard frame is a textual excerpt from the actual case. The center column of the board represents the proposed screen design, encompassing both graphics and text. On the final and right board are actions to be integrated into the design.

Figure 1. Storyboard


Case
Screen
Action
Teacher's Dilemma
marquee
Title screen with running marquee. Left frame - menu links. "Credits" link goes to Development Team, "Instructions" goes to instructions, and "Case Study" goes to Background.
Background
There are several characters appearing in this case, so perhaps we should learn a little about them before we begin. Click on a picture below to review background information.
Lower left menu bar allows user to access any part of the case non linearly. Scrolls down to allow 11 selections.
Background screen in main frame provides links from each name or picture to document about that character.
When a picture is clicked, goes to that character's background information
Jefferson Elementary School is in Everton, a medium-sized city in the Northeast with a diverse population of about 65,000. The school district serves about 8,000 students
Header describes the subject, followed by the image, and then the information which may or may not be relevant to the case.
An arrow at the bottom of the

Storyboarding and graphic representations of instructional screens and site maps flowed out of brainstorming sessions and into the prototype product. Using various tools for this project such as Asymetrix© ToolBook, Hypertext Markup Language (HTML), JAVAScript™, and JAVA™ applets, the

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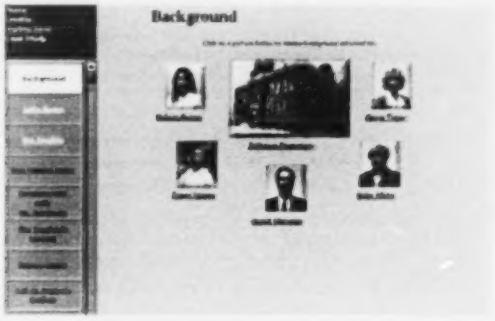
Rapid Prototyping phase of the process involved an actual working model of a portion(s) of the storyboard. The team reviewed the prototypes biweekly, and these review and revise sessions resulted in the client / SME's having a better vision of where the website was headed and could make recommendations for smaller changes. We discussed the need for forthright feedback and were particularly concerned that our student developers would be offended by faculty critiques. However, this concern was unfounded and the students soon felt comfortable debating issues during these sessions. The subgroup of student programmers with the faculty advisor worked to produce the prototype for each subsequent review session. As the website developed, animation, sound, and interactive segments were integrated into it, bringing the product through a startling evolution in the period of a year.

The Product

The final product was a website consisting of approximately 25 webpages that utilized the strengths of the WWW, such as hypertext links to resources and learner-directed menu choices. They consisted of a home page (see Figure 2), acknowledgements, instructions, and the case study. The case itself was divided into sections, organizing the story into its critical chronological stages. In the first section, students are introduced to the new teacher, the student, the principal and other teachers in the school. Demographics were available on the school itself, but the learner determined the order of information access and, in fact, whether or not to access the information at all. While making the information available, it was up to the learner to decide what information they needed and to discriminate between useful and nonuseful information.

Figure 2. Getting Acquainted



Links to resources such as student records and school guidelines were also embedded in the story and the learner had to decide to access the information. There were no menu links to these resources, as a practicing teacher would have to decide with in a real situation what information they might need to facilitate their decision-making. The client/SME specifically wanted students to have to actively investigate the resources, not just have them handed to them in the menu.

Student remote access was taken into consideration and any motion objects were animated gifs rather than video clips to eliminate download waits. Sound clip file sizes were kept small for the same reason and were only used where they supported the content or were used as an object of interest.

Results of the Pilot

A field test of the product was conducted in the content specialist's spring semester of the course. At the end of the course, Likert Scale attitudinal surveys were completed by the 49 students. The feedback from these surveys impacted the final product, which was implemented the following academic year. The results (see Table 1) showed the students were very positive about the instructional value and aid to retention that the WWW based case study afforded them. They liked having control over the navigation

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through the site and the accessibility of the instruction. Through the WWW they could spend as much time as needed in thinking through the scenario and their recommended solutions to the "Teacher's Dilemma" case. In addition, the client/SME was delighted with the resulting product and was encouraged to think about other applications of technology within the existing curricula.

Table 1: Student Rankings of Key Variables

	Student Average Ranking
Content of Study:	
Memorable	4.24
Realistic	4.47
Thought Provoking	4.41
Computer as a Medium	
Pictures Added Meaning	4.59
User Friendly Instructions	4.12
Ease of Navigation	4.22
Comparing Paper to Computer	
Interesting	4.22
Enjoyable	4.37
Informative	4.63

The scalability of this project indicates the process can be successfully replicated in the remaining case studies of the course, if desired, as well as be applied to similar projects in other disciplines such as training and development. Providing controlled but accurate experiences, while still allowing for safe cognitive exploration, would encourage trainees to examine the various aspects of the situational simulation. The cost-effective nature of the web-based delivery makes this an attractive alternative to paper and ink.

References

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